



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

# IJRSET

International Journal of Innovative Research in  
**SCIENCE | ENGINEERING | TECHNOLOGY**

# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 11, Issue 5, May 2022

**ISSN** INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA

Impact Factor: 8.118

9940 572 462

6381 907 438

[ijrset@gmail.com](mailto:ijrset@gmail.com)

[www.ijrset.com](http://www.ijrset.com)



# Allelopathic Impact of *Arundo donax* in Integrated Management of Barley Crop

Dr. Rajendra Kumar<sup>1</sup>, Janak Raj<sup>2</sup>

Department of Botany, Dr. Bhim Rao Ambedkar Govt. College Sri Ganganagar, Rajasthan, India<sup>1</sup>

Assistant Professor of Botany, Department of Botany, Government National College, Sirsa, India<sup>2</sup>

**ABSTRACT:** *Arundo donax* was screened for their allelopathic potential to the growth of barley seedlings. The 3% aqueous leachate was tested for seed germination of barley in laboratory bioassay. The *Arundo donax* was found to enhance the growth of barley seedlings. The aqueous leachate of Bg parts was more pronounced growth of barley seedlings than Ag parts. This study suggested the future prospects of the integrated management of barley crop using the allelopathic potential of *A. donax*.

**KEYWORDS:** Allelopathic potential, leachate.

## I. INTRODUCTION

*Arundo donax* L., the Giant reed (Poaceae), native to Europe is perennial, cane like grass found in tropical to temperate regions. The plant is of high economic importance. It is used in making roof and construction material (Anderson, 1991). Giant reed stem is used in preparation of walking sticks, finishing poles, mats and basket. It was well known to exhibit allelopathy in aquatic ecosystem. *A. donax* form large continuous clonal root masses and accumulate allelochemicals in their rhizospheric soil and form monospecific stands (Szczepanska and Szczepanski, 1982; Sharma, Khushwaha and Gopal, 1990; Gupta, 1998; Khatri *et al.*, 2007). Allelochemicals like plant hormones (Olofsdotter, 2011) show both growth promoting and inhibiting properties depending upon its concentration (Narwal, 1999). Gupta (1998) confirmed that field soil of *A. donax* accumulated allelochemicals of phenolic nature which inhibited the growth of many crops. In this present study *A. donax* promoted the growth of barley seedlings.

## III. MATERIALS AND METHODS

*Arundo donax* L., plants with rhizome were collected from Botanical garden, University of Rajasthan for study their allelopathic potential against test crop barley (*Hordeum vulgare* variety Raj.4229). The below ground portions of samples were cleaned with soft brush. These samples were washed gently with tap water and distilled water thereafter and dried on absorbent paper. The leachate of three percent concentration (w/v) of *A. donax* was prepared by soaking 3g plant material in 100 ml of distilled water, each for 24h and then filtered. Pre-soaked material was separated after filtering through fine muslin cloth and the aliquot obtained was used as aqueous leachate.

### ***In vitro* Seed Germination and Seedling Growth Lab Bioassay:**

The *in vitro* seed germination and seedling growth bioassay experiments were performed on the growth of test crops barley under laboratory conditions. The seeds of crops were surface sterilized with 0.1 % HgCl<sub>2</sub> solution for one minute and washed thereafter 4-7 times with sterilized distilled water and dried with filter paper. The pre-sterilized petriplates (9 cm) were lined with two filter papers. Ten healthy seeds of test crops were placed at equidistance on top of the filter paper in petriplates. Each treatment was replicated 3-5 times for test crop barley. As per treatment, each petriplate received 5 ml of leachate on first day and 3 ml leachate on 2, 4 and 6 days after sowing (DAS). The petriplates were kept in BOD incubator at and 25-30°C. The seedlings were harvested 7 days after sowing and germination of seeds, lengths of shoot and root of seedlings were measured. Subsequently, these were kept in an oven for drying at 80°C for 24 h and weighed thereafter for total dry weight.

## IV. RESULTS AND DISCUSSION

The data on the impact of aqueous leachate of 3% (w/v) concentration of above ground (Ag) and below ground (Bg) plant parts of *Arundo donax* on germination and growth of barley seedlings is given in Table 1. The aqueous leachate of Bg



parts of *A. donax* increased the growth of barley seedlings. Whereas Ag parts did not show any marked difference over the control. The % germination was 89 and 93% of control in Ag and Bg parts respectively. The root length remained 86% of control in Ag part whereas it increased to 127% of control in Bg part. In case of shoot, the length was 113 and 119% of control in Ag and Bg parts respectively. Total dry weight was 100 and 134 % of control in Ag and Bg parts respectively at 7 DAS (Fig 1.).

The ANOVA was significant in root length and total dry weight. The shoot length and % germination was found to be insignificant. Further, Dunnett's test was applied to determine the significant differences between each mean of treatment. It showed that Bg part effectively enhanced the root length and total dry weight of barley seedlings.

*A. donax* forms the monoculture stands that physically inhibited the other species (Rieger *et al.*, 1989; Bell, 1997). Gupta (1998) confirmed that field soil of *A. donax* accumulated allelochemicals of phenolic nature which inhibited the growth of many crops. Similarly the present study shows that above ground parts of *A. donax* was found more toxic to the growth of barley than belowground parts. *A. donax* promoted the growth of barley plants obviously due to the presence of low concentration of bioactive compound in Bg parts than Ag parts. This study suggested the future prospects of the integrated management of barley crop using the allelopathic potential of *A. Donax*.

### REFERENCES

- 1) Anderson, kat.1991. Wild plant management: cross-cultural examples of the small farmers of Jaumave, México and the Southern Miwok of the Yosemite region. *Arid Lands Newsletter* 31 : 18-23.
- 2) Bell, Gary P. 1997. Ecology and management of *Arundo donax*, and approaches to riparian habitat restoration in Southern California. In: Brock, J.H.; Wade, M; Pysek, P.; Green, D. eds. Plant invasions : studies from North America and Europe. Leiden, The Netherlands: Backhuys Publishers :103-113.
- 3) Gupta, J. 1998. Studies on allelopathic potential of some terrestrial and aquatic weeds. Ph.D. Thesis, Deptt. of Botany, Univ. of Rajasthan, Jaipur, India.
- 4) Khatri, P.K., H.R. Bora and P. Pobam. 2007. *Phragmites karka* Trin. ex Steud., A potential forage crop in and around Kaziranga National Park, Assam. In Biodiversity Utilization and Conservation. Eds. A. Aranachalam and K. Arunachalam. Aavishkar Publisher, Distributor, Jaipur. 65-71.
- 5) Narwal, S.S. 1999. Allelopathy Update, Science Pub Inc, 578080649.
- 6) Olofsson, M. 2011. Barley – A step toward use of allelopathy. *Agronomy J.* 93: 3-8.
- 7) Rieger, P.J., D.A. Kreager. 1989. Giant reed (*Arundo donax*): a climax community of the riparian zone, In: Protection, management and restoration for the 1990's: Proceedings of the California Riparian Systems conference: Davis, CA. Gen. Tech. Rep. PSW-110. Berkeley, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Forest And Range Experiment Station: 222-225.
- 8) Sharma, K.P., S.P.S. Khushwaha and B. Gopal. 1990. Autotoxic effect on *Phragmites karka* (Retz) Trin. ex steud. plant on its seed germination. *Geobios* 17 : 287-288.
- 9) Szczepanska, W. and A.J. Szczepanski. 1982. Interactions between *Phragmites australis* (Cav.) Trin. ex Steud. and *Typha latifolia* L. *Ekol. Pol.* 30:165-186.

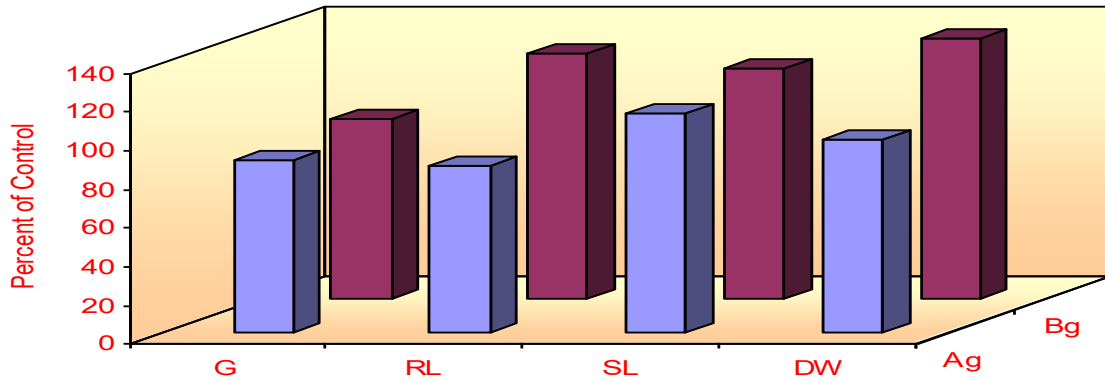
**Table 1: Allelopathic impact of 3 % (w/v) aqueous leachate of above ground (Ag) and below ground (Bg) plant parts of *Arundo donax* on test crop barley**

Growth parameters	Control	<i>A. donax</i>		LSD
		Ag	Bg	
Germination (%)	90.00 ±5.77	88.00 ±0.00	83.33 ±3.33	11.00
GIR	-	11.11	6.4	-
Root length (cm)	1.81 ±0.12	1.68±0.01	2.42±0.00*	0.40
Shoot length (cm)	1.56 ±0.17	1.82±0.01	1.91±0.01	0.28
Total dry weight (g)	0.026 ±0.01	0.031±0.01	0.037±0.01*	0.00

Mean ±SE, GIR- Germination inhibition rate, LSD- Least significant differences, \* Significant at 0.05 % level by Dunnett's test applied after ANOVA



*Arundo donax*



**Fig.1-G - % Germination, RL - Root length (cm), SL - Shoot length (cm), DW - Dry weight (g), Ag - Above ground plant parts, Bg - Below ground parts**



**INNO SPACE**  
SJIF Scientific Journal Impact Factor  
**Impact Factor: 8.118**



**ISSN** INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA



# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 **9940 572 462**  **6381 907 438**  **ijirset@gmail.com**



[www.ijirset.com](http://www.ijirset.com)

Scan to save the contact details